

## WASHER

The present invention relates to improvements in a  
5 washer for use in plumbing, especially in mounting a  
tap or connecting pipework to a sink, washbasin or  
other sanitary unit, such as a toilet cistern.

To convey water from a water supply to, for  
example, a sink, a water supply pipe is connected to a  
10 tap mounted on the sink. The tap has a tap head  
including a water outlet and a valve, a stem having an  
external thread, and an annular seating flange around  
the stem. The tap is inserted into a mounting aperture  
in the sink so that the tap head is located above the  
15 sink with the seating flange resting on an upper  
surface of the sink and the threaded stem is located  
below the sink. The water supply pipe is connected to  
the stem by a standard plumbing connection, such as a  
threaded connector, which includes a sealing washer.  
20 To ensure a watertight connection the threaded tap stem  
may be coated with a sealant, such as PTF tape or BOSS  
WHITE™ prior to threadably engaging the connector of  
the supply pipe. Immediately beneath the sink unit, at  
the point at which the stem emerges, a nut is located  
25 on the threaded stem; and a mounting washer is located  
between the nut and the sink unit. The nut is  
tightened so that the sink unit is gripped between the  
washer, below the unit, and the seating flange above  
it, thus ensuring that the tap is held tightly on the  
30 unit and cannot rotate with respect to the unit.

However, these mounting washers are prone to  
splitting, because of the relatively high pressure  
exerted on them by the nut, and require relatively

frequent replacement. The washers, known because of their shape as "top-hat" washers, usually have substantially square bores. Cracks develop from the corners of the square bore, which subsequently cause the washer to split. It is important to replace damaged top-hat washers because otherwise the tap head will eventually work loose and become free to rotate with respect to the unit when it is used. The tap is attached to a rigid supply pipe which cannot rotate with the tap and therefore the connection between the pipe and the tap is put under stress. If left, the connection will eventually fail, causing a leak.

It is difficult and time-consuming to replace the known top-hat washers, since replacing them requires the plumber to perform a number of steps, as follows:

- (1) turning off the house water supply by turning off the main water stop-tap;
- (2) opening the tap on the unit to run off any existing house system water;
- (3) disconnecting the water supply pipe from the bottom of the threaded stem of the tap;
- (4) cleaning off all of the sealant from the threaded stem;
- (5) unscrewing the lower tap nut from the stem;
- (6) removing the old top-hat washer, by cutting if necessary;
- (7) sliding the new top-hat washer up the stem;
- (8) re-screwing the lower tap nut up the stem, to hold the new top hat;
- (9) placing fresh sealant around the lower part of the stem;
- (10) connecting the water supply feed pipe back on to the stem;

(11) turning on the house water supply.

This procedure is often hampered by the fact that the plumbing is usually housed in a small area behind the sink unit, meaning that the plumber has to work in cramped conditions and often he cannot see what he is doing. Such difficulties mean that faulty top-hat washers are often not replaced, but rather other pieces of packing material, such as wood, for example, are used to ensure that the tap stem is held tightly in the unit. This practice is not satisfactory as the wood may easily become dislodged, and the load of the securing nut is not evenly distributed on the underside of the unit. If the top-hat washer is not replaced leaks in the pipe may develop, thus necessitating further expensive and difficult work on the plumbing system.

Similar mounting washers are also used in the introduction of pipes into cisterns. Cisterns, for example, generally have two pipes: a cold feed pipe, and an overflow pipe. The pipes are held to the bottom of the cistern by a nut, a washer and adhesive. The difficulties encountered with the lifetime and replacement of this washer are similar to those outlined above.

A further problem with known methods of introducing pipework into sanitaryware is that often the hole in the sink unit is significantly larger than the diameter of the stem, or pipe member, of the tap which is to be inserted into the hole. This means that the taps must be centred in the hole manually when the tap is being fitted and tightened. Typically there can be a 12 mm difference in the diameter of the hole compared with the diameter of the stem. Therefore to

prevent the tap from moving around in the hole the tap must be held onto the unit firmly by the nut. However, a further problem affecting ceramic units in particular is that the ceramic is prone to cracking or chipping when pressure is applied. This means that when the tap is fitted great care must be taken so that the ceramic does not crack when the nut is tightened. If the tap is not centred in the hole in the sanitary unit the ceramic is more likely to crack, since the edge of the nut may catch on the edge of the hole.

Embodiments of the present invention aim to overcome the difficulties in replacing top-hat washers by providing a washer which can be fitted between the nut and the sanitary unit without the nut being removed from the stem of the tap, thereby eliminating most of the above described steps.

Embodiments of the present invention further aim to provide a washer which centres the tap on the sanitary unit and prevents the tap from moving in the hole when it is fitted.

One aspect of the present invention provides a washer for use in a plumbing installation in which a pipe member is mounted in or connected to an article of sanitaryware, the washer comprising at least first and second parts, the parts being moveable with respect to each other between a first configuration in which they define a bore, such that in use the washer may enclose a pipe member which passes through the bore, and a second configuration in which a pipe may be inserted into or withdrawn from the bore generally radially.

The parts may be completely separable.

Preferably said parts include latch means for allowing the parts to releasably engage each other.

Alternatively the parts may be hingedly attached at an edge region of the washer.

The parts may be held together in the first, closed configuration by a releasable latch.

5       The releasable latch may comprise a projection and socket.

Alternatively the parts of the washer may be permanently attached together in one region and may be flexible so that the two parts can be urged apart to  
10       adopt the second, open configuration.

The two parts may be flexed apart in a direction substantially parallel to the axis of the bore.

Preferably the two parts of the washer are made of plastic and are formed as one piece of plastic.

15       The washer may include a slot located between the two parts of the washer, which slot may be used for prising apart the two parts of the washer.

An internal surface of the bore may be threaded.

A second aspect of the present invention provides  
20       a washer for use in plumbing in which a pipe member passes through a hole in an article of sanitaryware, creating a gap between the hole in the sanitaryware and the pipe member, the washer comprising at least one part having a bore defined therein for receiving the  
25       pipe member, and at least one projection extending from the washer in a substantially axial direction, for locating in the gap between the pipe member and the article when the washer is urged against the article in use, so as to centralise the washer substantially with  
30       respect to the hole in the article.

Preferably the or each projection is arranged so that when the washer is inserted into a hole in an article of sanitaryware, and the pipe member passes

through the washer, the pipe member is located substantially centrally with respect to the hole in the article.

Preferably the one or more projections are  
5 flexible so that they may fit into holes of different sizes.

The one or more projections may comprise a split-ring.

The one or more projections may comprise a frusto-  
10 cone.

Preferably the one or more projections are resiliently biased radially outwardly against a hole in an article in use.

Preferably the bore is substantially circular.

15 Preferably there are three projections protruding from the washer in a substantially axial direction.

The at least one projection may be flexible, and may have at least one substantially flat bearing surface for bearing against an interior of a hole in an  
20 article of sanitaryware.

The interior surface of the bore in the washer may be threaded for engagement with a pipe.

A third aspect of the present invention provides a method of installing a washer on a pipe member the  
25 washer comprising two parts which are movable with respect to each other between a closed configuration in which they define a bore therebetween and an open configuration in which a pipe member may be inserted or withdrawn from the bore generally radially with respect  
30 to the washer, the method comprising causing the parts of the washer to adopt the open configuration, introducing the pipe member between the parts substantially radially with respect to the washer, and

causing the parts of the washer to adopt the closed configuration, thereby substantially enclosing the pipe member within the bore defined by the parts of the washer.

- 5       The method may further comprise the step of bringing together two separate parts of the washer around the pipe member and causing the two separate parts to engage to enclose the pipe member.

- 10       The method may further comprise the step of causing the two parts of the washer to adopt the closed configuration by hinged movement of the parts.

- 15       Alternatively the method may further comprise the step of pressing together the two parts around the pipe member until the two parts make a latching engagement, which latching engagement produces an audible indication, such as a click, to confirm that the latching has occurred.

- 20       According to a fourth aspect of the present invention there is provided a method of centralising a pipe member in a hole in an article of sanitaryware, the pipe member having a pipe portion, the pipe portion being housed in a hole of the sanitaryware, and the diameter of the hole being greater than the diameter of the pipe portion, such that a gap exists between the pipe portion and the hole in the sanitaryware, the method comprising the steps of: fitting a washer to the pipe portion, the washer having at least one projection extending from the washer in a substantially axial direction with respect to the pipe portion, so that the at least one projection extends towards the article of sanitaryware; locating the at least one projection in the gap between the sanitaryware and the pipe portion; tightening the washer against the sanitaryware so that
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the at least one projection makes a friction fit between the pipe portion and the hole of the sanitaryware so that the pipe member is centralised with respect to the hole in the sanitaryware.

5       The washer may be openable and movable between a first closed configuration defining a bore and a second open configuration, the step of fitting the washer may further comprise the steps of: opening the washer; engaging the bore of the open washer with the pipe  
10       portion; closing the washer around the pipe portion.

Preferred embodiments of the invention will now be described by way of example, with reference to the accompanying drawings, in which:

15       Figure 1 shows a washer located between a securing nut and a lower surface of a sanitary unit.

Figure 2 shows a cross section of the washer shown in Fig. 1.

Figure 3 shows an embodiment of washer in a first,  
20       closed configuration;

Figure 4 shows a split washer in a second, open position;

Figure 5 shows an embodiment of a washer having centralising projections for location within an  
25       aperture in an article of sanitaryware;

Figure 6 shows a split washer with centralising projections, in a closed position;

Figure 7 shows a split washer with centralising projections, in an open position;

30       Figure 8 shows a cross-sectional view of a washer having centralising projections positioned between a nut and the underside of a sanitary unit.



Turning to Figure 1, this shows a tap unit 2 attached to a sink unit 4. The tap has a head 2a, a flange 2b and a threaded stem 2c. The threaded stem 2c passes through a hole (not shown) in the sink unit 4 and the flange 2b rests against an upper surface of the sink unit 4. A nut 6 is threaded onto the stem 2c of the tap, and a washer 10 is disposed between the nut 6 and the underside of the sink unit 4. The tap unit 2 is held against the sink unit by the flange 2b and the nut 6 and washer 10. From Figure 1 it can be seen that the washer has a raised portion 10a in the centre. Preferably the raised portion has a larger diameter than the diameter of the nut thereby to spread the load exerted on the washer by the nut and thus lessen the likelihood of the washer splitting. Figure 2 shows the washer 10 of Figure 1 in cross section. The washer has an upper recessed portion 8a and a lower recessed portion 8b, and a bore 12 extending right the way through the washer for receiving a pipe (not shown).

In this example the washer is made of moulded plastic. The purpose of the upper recessed portion is to accommodate any shoulder of the tap which extends below the underside of the unit and to increase the surface area to volume ratio of the washer, so that when the washer is made the plastic cools more quickly, reducing manufacturing costs. The top of the nut 6 (shown in Fig. 1) fits into the lower recessed portion of the washer 8b. The bore 12 receives the stem 2c of the tap unit 2 (Fig. 1) when the washer is fitted over the tap unit.

Figure 3 shows generally at 10 a preferred embodiment of split top-hat washer in accordance with the invention. The washer is shown in its closed

position and an aperture 12 is defined in the centre.  
The washer comprises a single piece of moulded plastic  
and is split down line 14 to form two broadly  
triangular parts 18 and 20. The two parts remain  
5 attached to each other by a hinge in one corner 16 of  
the washer. The parts 18 and 20 are shaped so that the  
first part 18 has a key projection 22, and the second  
part 20 has a socket 24, the projection and the socket  
being shaped so as to releasably engage with each  
10 other. The first part has a further cut-away portion  
which forms a quick-release slot 26.

The washer is shown in its open position in Figure  
4. To open the washer a screwdriver or a similar tool  
is inserted into the quick release slot 26. The first  
15 and second parts of the washer are then urged apart  
whilst still being held together by the hinge 16.  
Opening the washer in this way allows it to be fitted  
to and removed from the stem of a tap on the underside  
of a sanitaryware unit, as shown in Fig. 1, without  
20 having to remove the nut from the stem. However, it  
may be necessary to unscrew the nut 6 partially so that  
there is more space on the stem within which to fit the  
washer. The nut should then be tightened so that the  
washer is urged against the underside of the unit.

25 To close the washer the first and second portions  
are simply urged together until the key projection 22  
locates in the socket 24. In use the open washer is  
positioned over the stem, between the nut and the unit  
so that the stem is located in the aperture 12. The  
30 washer is then closed causing the corresponding  
projection 22 and socket 24 to fit together. Then the  
washer substantially encloses the stem. It is  
advantageous if pushing the projection and socket

together produces a clicking sound, so that the plumber fitting the washer can hear that the washer has been fitted correctly, since he may not be able to see the washer to verify that this is the case. To prevent the two parts of the washer being forced apart when the nut is tightened the projection and the socket are shaped in a complementary way so that the sides are inclined to each other, with the wider end of the projection further from the first part of the washer, as shown in Fig. 4. The resilient material from which the washer is moulded permits the projection and socket to deform resiliently and hence temporarily when they are pressed together or prised apart with sufficient force. It is advantageous for the upper recessed portion 8a to be circular, since if it is square cracks can form at the corners of the square. This in turn can lead to the washer splitting. Thus having a circular aperture increases the lifetime of the washer.

Figure 5 shows a washer 40 having an aperture 42 and three axially extending centralising projections 44 for location within a hole in an article of sanitaryware. Figure 6 shows a split washer, split down line 46, in its closed position. This washer functions in a similar way to the split "top-hat" washer shown in Figs. 3 and 4. Figure 7 shows the washer of Fig. 6 in its open position. One portion of the washer has a projection 48 protruding therefrom, and the other provides a corresponding socket 50. The washers shown in Figs 5 to 7 are designed for use in most ceramic sanitaryunits, and therefore are smaller in diameter than those shown in Figs. 3 and 4, which are generally used in stainless steel sinks. The washers for sink units are usually of a larger size

since there is often a larger space under the sink in which the washer can be housed; it is advantageous to have a larger washer since the force exerted by the nut is spread over a larger area of the unit.

5        Figure 8 shows a cross-section of a washer 70, with centralising projections 72, located between a nut 74, the underside of a sanitary unit 76, and the base of a tap 78, having a lower stem 80. The resilient projections 72 locate in the space between the hole in  
10       the sanitary unit 76 and the stem of the tap. Fig. 8 shows the washer 70 having a recessed portion on its lower edge, into which the nut fits. Screwing the nut up the stem of the tap against the washer causes the projections to centralise the washer within the hole.  
15       The stem of the tap is located centrally within the washer and so the tap is centred with respect to the hole in the unit. It is advantageous for the projections to be shaped as shown in Fig. 8, having a convex outside edge. Shaping them in this way and  
20       ensuring that they are flexible means that the projections can adapt to a variety of different hole sizes, since if the projections enter a relatively small hole the they are guided radially inwards by virtue of their shape. Since it is advantageous to  
25       have flexible projections it is better to have a number of smaller projections, rather than, for example a single cone-shaped projection. It is advantageous to have at least three projections, since this means that the tap can be centred on the hole in two dimensions.  
30       An alternative configuration for the projections might be a split cylinder.

Any of the washers shown in the Figures can be provided with a thread on the internal surface of the

aperture. Thus the washer can be threaded onto the tap thread and the need for a separate nut to hold the tap against the unit is eliminated.

The term "article of sanitaryware" as used herein  
5 shall be taken to include fixtures, fittings or  
installations such as, but not limited to, baths,  
sinks, basins, showers, bidets, water tanks, boilers,  
toilets and urinals and appliances requiring plumbed  
connections.